ECE8780: Assignment 1

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1 Problem Definition

This assignment requires you to develop a CUDA Kernel that can convert a colored image to a greyscale image. Mathematically, given a colored image of dimensions $\mathbb{R}^{hxwxc}$, a greyscale operation produces an image of dimensions $\mathbb{R}^{hxw}$. On a pixel level, given the R,G,B channels of a colored image at location i, a greyscale image can be produced by using the following equations:

$$o[i] = 0.299 * R + 0.587 * G + 0.114 * B \tag{1}$$

$$o[i] = (R + G + B)/3 \tag{2}$$

Figure 1: GreyScaling Operation

In both equations, i denotes the output pixel location. Initially you may want to use Equation 2 to compute the greyscale image but eventually you need to turn in a working kernel with Equation 1. An example of greyscaling is shown in Figure 1.

2 Deliverables

You will need to turn in the following things:

1. A working kernel that has been tested against images of different sizes.
2. A LaTeX formatted report that details the design procedure and profiling results. Specifically, describe the challenges faced during the programming of the kernel.

The compilation instructions are present in `README.md` and must be followed for proper compilation on Palmetto. For your reference a serial code implementation is provided in the assignment zip folder. You may reach out to TA during office hours or via email.